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EXAMINER	
NGUYEN, LAM S	

ART UNIT	PAPER NUMBER
2853	

DATE MAILED: 09/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/642,951	FONTAINE ET AL.	
	Examiner	Art Unit	
	LAM S. NGUYEN	2853	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 August 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-6, 9, 13, 15-16, 27, 30-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Suzuki et al. (US 5521619).

Referring to claims 1, 13, 16, 27, 30, 33:

Suzuki et al. discloses an apparatus that is an ink jet print head (*FIG. 2*) comprising

a plurality of droplet ejection devices, each said droplet ejection device including

a fluid chamber (*FIG. 2, element 15*) having a volume and an ejection nozzle (*FIG. 2, element 2*),

an electrically actuated displacement device (*FIG. 2, element 8, 10*) that moves between a displaced position and an undisplaced position to change said volume of said chamber as a capacitance associated with the electrically actuated displacement device changes in charge between an actuated condition and an unactuated condition (*FIG. 2: The piezoelectric 8 displaces the vibration plate 5 to change the volume of the chamber 15*), and

a first switch (*FIG. 3, elements 21-22*) that has a first input connected to an electric source terminal (*FIG. 3, element VH*), a first output connected to said electrically actuated displacement device (*FIG. 3: The collector of transistor 22 is connected the actuator*

through transistors 29-30), and a first control signal input (*FIG. 3, element IN1*) to determine whether said first input is connected to or disconnected from said first output, and

wherein an applied electric source distribute an electrical signal to said first inputs of said plurality of droplet ejection devices (*FIG. 3, element VH*), and

a controller that provides respective charge control signals to respective said first control signal inputs to control an extent of change in charge on respective said capacitances when the respective said first switch connects said electrical signal to the respective said electrically actuated displacement device (*FIG. 3: The corresponding unit that outputs IN1and IN2 signals*) and to set a constant amount of charge on respective said capacitances in the actuated condition when the respective said first switch disconnects said electrical signal to the respective said electrically actuated displacement device, wherein the disconnection maintains a constant voltage on respective said capacitances by the storing the constant amount of charge on respective said capacitances (*FIG. 4A-D: The charge voltage Vo is constant during period T2-T3 in which the transistor 22 is turned off so the power supply VH is disconnected to the collector of transistor 22. In addition, since there is no discharge pulse applied to the input IN2 during period T2-T3, there is no way for the energy stored in the capacitor 24 and the piezoelectric itself to be discharged. As a result, the charge voltage Vo is constant due to the capacitance of the capacitor 24 and the piezoelectric even though there is no charge energy due to the disconnection of transistor 22*).

Referring to claims 2, 34: wherein said electrically actuated displacement device moves between a displaced position and an undisplaced position as a capacitance associated with the electrically actuated displacement device changes between a charged, actuated condition and an

uncharged, unactuated condition, and wherein said controller that provides respective charge control signals to respective said first control signal inputs to control the extent of charge placed on respective said capacitances by the time that the respective said first switch connects said electrical signal to the respective said electrically actuated displacement device (*FIG. 4A-E*).

Referring to claims 3, 15, 31, 35: wherein each said droplet ejection device also includes a second switch (*FIG. 3, elements 26*) that has a second input connected to a discharging electrical terminal (*FIG. 3*), a second output connected to said electrically actuated displacement device (*FIG. 3: The collector of transistor 26*), and a second control signal input (*FIG. 10b, element IN2*) to determine whether said second input is connected to or disconnected from said second output, and wherein said controller provides respective discharge control signals to respective said second control signal inputs to control discharge of the charge on said respective capacitances.

Referring to claims 4-5, 6, 9: wherein each said droplet ejection device comprises a first resistance between said electric source and said electrically actuated displacement device and wherein each said droplet ejection device comprises a second resistance between said discharging electrical terminal and said electrically actuated displacement device (*FIG. 3, elements 23, 27*).

Referring to claim 32: wherein the amount of charged on the capacitance is greater in the actuated condition than the amount of charge in the unactuated condition (*FIG. 4D: The charge time period T1-T2 is longer than the discharge time period T3-T4*).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-27, 29, 30-31, and 33-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al. (US 4563689) in view of Suzuki et al. (US 5521619).

Referring to claims 1, 13, 27, 30, 33:

Murakami et al. discloses an apparatus that is an ink jet print head (*column 4, lines 2-5*) comprising

a droplet ejection device including

a fluid chamber (*FIG. 1a, element 3*) having a volume and an ejection nozzle (*FIG. 1a, element 1*),

an electrically actuated displacement device (*FIG. 1a, element 7 and FIG. 11b, element 8*) that moves between a displaced position and an undisplaced position to change said volume of said chamber as a capacitance associated with the electrically actuated displacement device changes in charge between an actuated condition and an unactuated condition (*column 4, line 67 to column 5, line 8: A voltage applied to both plates of a piezoelectric becomes a voltage waveform similar to the charge and discharge characteristics of a capacitor*), and

a first switch (*FIG. 10b, elements Tr3, Tr4*) that has a first input connected

to an electric source terminal (*FIG. 1a, element +V3*), a first output connected to said electrically actuated displacement device (*FIG. 10b, element 8*), and a first control signal input (*FIG. 10b, element INPUT B*) to determine whether said first input is connected to or disconnected from said first output, and

a controller that provides respective charge control signals to respective said first control signal inputs to control an extent of change in charge on respective said capacitances when the respective said first switch connects said electrical signal to the respective said electrically actuated displacement device (*FIG. 10b: The corresponding unit that outputs INPUT B and INPUT A signals such as TIMER(4) in FIG. 12)*).

Murakami et al. does not disclose wherein the printhead including a plurality of droplet ejection devices that the applied electric source distribute an electrical signal thereto, wherein the controller sets a constant amount of charge on respective said capacitances in the actuated condition when the respective said first switch disconnects said electrical signal to the respective said electrically actuated displacement device, wherein the disconnection maintains a constant voltage on respective said capacitances by the storing the constant amount of charge n respective said capacitances, and wherein each said droplet ejection device has a first resistance that is between said electrical source and said electrically actuated displacement device and is external of an electrical path from said electrically actuated displacement device to said second switch, and further comprising a second resistance that is included in the electrical path from said electrically actuated device to said discharging electrical terminal and wherein said discharging electrical terminal is at ground (**Referring to claims 6, 9**).

Suzuki et al. discloses an ink jet printhead (*FIG. 2*) having a plurality of ink ejection devices each having an piezoelectric/capacitance actuator and being applied an electrical signal provided by an electrical source (*FIG. 3, element VH*), a first resistance that is between said electrical source and said electrically actuator and a second resistance that is included in the electrical path from said electrically actuator to ground (*FIG. 3, resistors 23 and 27*), and a controller that sets a constant amount of charge on the ink ejection device when a switch (*FIG. 3, element 22*) disconnects the electrical signal to the respective said ink ejection device, wherein the disconnection maintains a constant voltage on respective capacitances by the storing the constant amount of charge on respective said capacitances (*FIG. 4A-D: The charge voltage Vo is constant during period T2-T3 in which the transistor 22 is turned off so the power supply VH is disconnected to the collector of transistor 22. In addition, since there is no discharge pulse applied to the input IN2 during period T2-T3, there is no way for the energy stored in the capacitor 24 and the piezoelectric itself to be discharged. As a result, the charge voltage Vo is constant due to the capacitance of the capacitor 24 and the piezoelectric even though there is no charge energy due to the disconnection of transistor 22*). In addition, wherein each said droplet ejection device

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the driving circuit disclosed by Murakami et al. to keep the charge voltage constant during the disconnection of the switch as disclosed by Suzuki et al. The motivation for doing so would have been to make sure the ink ejection occurring before the charge energy to be discharged as taught by Suzuki et al. (*FIG. 4E*).

Murakami et al. also discloses the following claimed invention:

Referring to claims 2, 34: wherein said electrically actuated displacement device moves between a displaced position and an undisplaced position as a capacitance associated with the electrically actuated displacement device changes between a charged, actuated condition and an uncharged, unactuated condition (*column 4, line 67 to column 5, line 8: A voltage applied to both plates of a piezoelectric becomes a voltage waveform similar to the charge and discharge characteristics of a capacitor*), and wherein said controller that provides respective charge control signals to respective said first control signal inputs to control the extent of charge placed on respective said capacitances by the time that the respective said first switch connects said electrical signal to the respective said electrically actuated displacement device (*FIG. 11a-b*).

Referring to claims 3, 15, 31, 35: wherein each said droplet ejection device also includes a second switch (*FIG. 10b, elements Tr5, Tr6*) that has a second input connected to a discharging electrical terminal (*FIG. 10b, element –V4*), a second output connected to said electrically actuated displacement device (*FIG. 10b, element 8*), and a second control signal input (*FIG. 10b, element INPUT A*) to determine whether said second input is connected to or disconnected from said second output, and wherein said controller provides respective discharge control signals to respective said second control signal inputs to control discharge of the charge on said respective capacitances.

Referring to claim 4: wherein each said droplet ejection device comprises a first resistance between said electric source and said electrically actuated displacement device (*FIG. 10b, element VR: The resistor VR connects the electric source +V3 to the piezoelectric 8 during a charge period*).

Referring to claim 5: wherein each said droplet ejection device comprises a second resistance between said discharging electrical terminal and said electrically actuated displacement device (*FIG. 10b, element VR: The resistor VR connects the discharge electric source –V4 to the piezoelectric 8 during a discharge period*).

Referring to claim 7: wherein a single resistance is used to charge and discharge a respective capacitance (*FIG. 10b, element VR*).

Referring to claim 8: wherein a plurality of resistors, voltages and switches are connected to each said electrically actuated displacement device and controlled by said controller to change the charge on said capacitance (*FIG. 10b*).

Referring to claims 10-12: wherein said electrical signal is a controlled voltage signal, a controlled current signal, or a constant current (*FIG. 10b, INPUT A and B*).

Referring to claim 14: wherein said first control signal terminates the connection of said constant voltage to said electrically actuated displacement device when the charge on said electrically actuated displacement device is at a predetermined value which is less than said constant voltage (*FIG. 10b and FIG. 11a-b: Since the amplitude of signal M is equal to the subtraction of +V3 to the sum of VCE of Tr3 and VVR, the amplitude of signal M is less than V3*).

Referring to claim 16: wherein electrically actuated displacement device is a piezoelectric actuator (*column 4, line 67 to column 5, line 8: A voltage applied to both plates of a piezoelectric becomes a voltage waveform similar to the charge and discharge characteristics of a capacitor*).

Referring to claims 17-19: wherein said first control signals are controlled to provide uniform droplet volumes or velocities from said plurality of droplet ejection devices or to provide predetermined different drop volumes or velocities from different droplet ejection devices so as to provide pay scale control (*column 3, lines 65-68: Since the ink droplet size can be freely changed, the drop volumes can be controlled to be uniform or at predetermined value*).

Referring to claim 20: wherein said first and second control signals are controlled to connect said electrical signal to respective said electrically actuated displacement devices for respective predetermined times (*FIG. 9a-b*).

Referring to claim 21: wherein respective said first control signals are controlled to connect said electrical signal to respective said electrically actuated displacement devices until respective said electrically actuated displacement devices achieve respective predetermined charge voltages (*FIG. 11a-b*).

Referring to claims 22-23: wherein said first control signals are controlled to provide a voltage that is insufficient to eject a droplet, but is sufficient to move a meniscus of a liquid at an ejection nozzle of said droplet ejection device (*column 4, lines 13-17: Said preceding pulse not having enough energy for the ink to be ejected from the nozzle*).

Referring to claims 24-25: wherein said first control signals are controlled to inject noise into images being printed so as to break up possible print patterns and banding (*column 2, lines 37-40: The noise is the satellite droplets*).

Referring to claim 26: wherein said first and second control signals are controlled to vary the amplitude of charge as well as the length of time of charge on said electrically actuated

displacement device for the first droplet out of a droplet ejection device so as to match subsequent droplets (*column 6, lines 20-25: Changing the pulse height and width of the pulse*).

Referring to claim 29: wherein said controller controls said first switch as a function of the frequency of droplet ejection to reduce variation in drop volume as a function of frequency (*column 6, lines 20-25*).

3. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. (US 5521619) in view of Imanaka et al. (US 6467863) and Butterfield et al. (US 6685297).

- Suzuki et al. discloses the claimed invention as discussed in the first rejection except wherein said controller mounted to a monolithic body in which said fluid chambers are formed.

Imanaka et al. discloses an ink jet recording head having a controller (*FIG. 4B, element 46*) mounted on a circuit board (*FIG. 4B, element 33*) that a plurality of ink chambers are formed (*FIG. 4B, element 9 or 7a*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the circuit board of the print head disclosed by Suzuki et al. to include also the controller as disclosed by Imanaka et al. since this is a common technique well known in the art to eliminate the wire connection between the recording head and the controller in order to avoid any problem caused by the wire connection.

- In addition, Suzuki et al. and Imanaka et al. do not disclose wherein the controller includes a field programmable gate array.

Butterfield et al. discloses a printing apparatus having a controller that can be a

microprocessor based device programmed in a desired manner such as a field programmable gate array (*column 3, lines 6-12*).

Therefore, it would have been obvious for one having ordinary skill in the art at the time invention was made to modify the controller disclosed by Suzuki et al. in view of Imanaka et al. to be an field programmable gate array as disclosed by Butterfield et al. The motivation for doing so would have been to be able to program the operation of the controller in a desired manner as taught by Butterfield et al. (*column 3, lines 6-12*).

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LAM S. NGUYEN whose telephone number is (571)272-2151. The examiner can normally be reached on 7:00AM - 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, STEPHEN D. MEIER can be reached on (571)272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LN
09/19/2005

Hai Chi Pham

HAI PHAM
PRIMARY EXAMINER